1. **If you leave any part of this question blank, your assignment will not be marked and its weight will be transferred to the final exam.**

   Print the name and ID number of each group member (at most 4) for this assignment:

   _____

   _____

   _____

   _____

   Acknowledge **all** sources, including all references and all people not in your group with whom you discussed any part of any question (for each discussion, list the relevant questions) (continue on the back of this page if there is insufficient space):

   Each group member must read, agree to, and sign this statement:

   I am familiar with the Code of Student Behaviour. I understand that there are significant penalties for any infraction of this Code, including failure to acknowledge sources. I have not shared any written or printed version of any of my answers with any other student.

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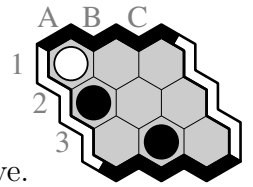
2. Consider this hex position with White to move. Explain why B1 is not a winning move.

_____

3. Above, give a winning move and explain why it wins, or explain why there are no winning moves.

_____

_____

_____

4. In year _____ the computer program _____ defeated Gary Kasparov in chess. Why does the search algorithm that worked well in chess does not work well in computer go?

_____

_____

_____

5. For the AlphaGo 2016 Nature paper, name the 1st, 2nd, and last authors and explain their roles.

_____

_____

_____

6. In October 2015 AlphaGo played suboptimal moves against Fan Hui, so some experts expected AlphaGo to lose to Lee Sedol. But some such moves were not errors, because

_____

Also, AlphaGo improved by March 2016, because (give 2 reasons)

_____

_____

7. Watch the AG-LS game 1 using the viewer at `https://deepmind.com/research/alphago/match-archive/alphago-games-english/`. The game info says *basic time 120 min, overtime 3x60 byoyomi*. What is a byoyomi, and when is it used up?

_____

What does move 26 commentary say about AlphaGo's time usage during the match?

_____

Why might have Lee Sedol have found it a challenge to play against this time usage?

_____

8. In go, what is a *passive playing style*?

_____

_____
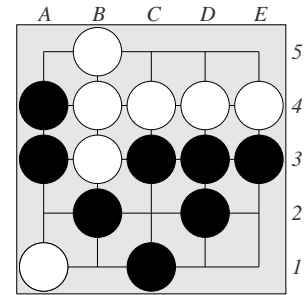
9. Consider this go position with White to play: In this position, by Tromp-Taylor rules, White has _____ stones and _____ territory points, Black has _____ stones and _____ territory points, so if neither player moves again, _____ wins by _____ points.

From the diagram, if White plays A2, Black's best reply is _____ because

_____

From the diagram, if White passes and Black plays A5, White's best reply is _____ and (assuming both players then play best possible) the final score will be _____ wins by _____ points.

From the diagram, if White plays D5 then Black's best reply is _____ and (assuming both players then play best possible) the final score will be _____ wins by _____ points.

_____

10. Explain why a 19×19 hex game ends after at most 361 moves.

_____

Explain why a 19×19 go game can last more than 361 moves.

_____

11. Consider a search tree with with one node at the root (level 0) and with each node at levels 0 through 9 having 4 children (so, 1 node at level 0, 4 nodes at level 1, 16 nodes at level 2, ...). Give the number of nodes at level 10. _____ In go, suppose that for any position you could (by magic) instantly identify at most four moves, with the property that the best move is one of those four, and that in any position in which at least 100 moves has been made you could (by magic) correctly predict the winner. How many positions would you would need to examine in order to find the best move from the original position? _____ Explain briefly

_____

12. From the 396 github code repo, install directory `simple/maze`. Explain briefly how to modify `maze.py` to make it deterministic.

_____

In `maze.py`, uncomment line 61, and comment out line 61. This changes the data structure from a FIFO list to a _____ list. On average, over all possible locations of the target, does this change (i) increase (ii) not change (iii) decrease the number of `while` loop iterations of this code on a fixed input? Explain briefly.

_____

On your machine execute `python3 rmaze.py < m.txt` 10 times. What was the fewest number of looks required? _____ For `m.txt`, what is the minimum possible number of looks? _____ What was the largest number of looks required? _____ For `m.txt`, what is the maximum possible number of looks? _____